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Arsenic in Vegetables
Grown in Yellowknife, N.W.T.

Prepared by
Ranjit Soniassy

ARSENIC IN VEGETABLES
GROWN IN YELLOWKNIFE, NWT

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WATER RESOURCES DIVISION

NORTHERN AFFAIRS PROGRAM

DEPARTMENT OF INDIAN AFFAIRS AND NORTHERN DEVELOPMENT

YELLOWKNIFE, NWT

FOR

HEALTH AND WELFARE CANADA

AND FOR

STANDING COMMITTEE ON

ARSENIC POLLUTION

YELLOWKNIFE, N.W.T.

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INTRODUCTION

A survey of arsenic in Vegetables was conducted in August 1978, at the request of Dr. R.D.P. Eaton, Research Medical Officer, Health & Welfare Canada.

Environmental health concerns of arsenic, accumulated in the Yellowknife environment, has resulted in ongoing monitoring programs of this toxicant in snow, water, human hair and vegetation.

This report details the level of arsenic in vegetables grown in Yellowknife during the summer of 1978.

MATERIALS METHODS

Forty-two samples were collected from several home garden plots around the city of Yellowknife, NWT. The garden plots were located in five general areas: Con Mine, Giant Mine, Old Town, Downtown and Frame Lake subdivision.

The samples were of the following types,

Leaves : lettuce, green onions, dill weed, parsley, Labrador tea, cabbage and beet leaves;

Fibrous Stems : Rhubarb and celery;

Pods : pea pods;

Tubers (underground parts) : radish, onions, carrots, beet root, yellow turnips and potatoes;

Berries : gooseberries, raspberries, blueberries, black currants, cranberries and rose hips.

Each sample was subdivided into two fractions. One fraction was prepared by washing with water, as would normally be done prior to cooking or consumption. The other fraction was not washed. Both fractions were dried at 95C and ground.

All samples were acid digested and total arsenic determined by the silver diethyldithiocarbamate colorimetric method. The results are reported on a fresh weight basis.

RESULTS AND DISCUSSION

The results of total arsenic in unwashed and washed vegetables are shown in Table 1.

Total arsenic in the unwashed and washed samples ranged from 0.09 to 2.42 and 0.06 to 2.05 mg/Kg fresh weight. Washing with water, as would normally be done prior to cooking or consumption, removed from 9 to 75% of the arsenic. This indicates that variable amounts of arsenic ranging from 9 to 75% were of surficial origin, not cellular.

Total arsenic in all samples were within the limits reported for previous years, (1,2,3,4,5,6).

The mean arsenic content of the 42 samples were as follows:

Unwashed samples	0.51 mg/Kg
Washed samples	0.32 mg/Kg

amounting to a mean 37% removal by surficial washing with water.

Table 2 shows a comparison of the levels of total arsenic in the washed samples for the five locations. Samples of beet leaves, black currants, blueberries, celery, cranberries, dill weed, gooseberries, Labrador tea, radish, raspberries, rose hips, and turnips were collected in one location only and therefore their arsenic contents cannot be evaluated as to origin. Comparison of levels of arsenic in vegetables collected at two or more locations shows that:

(1) Giant Mine had the highest level in beetroot, cabbage, onions, pea pods and potatoes

(2) Con Mine had the highest level in carrots and green onions

(3) The Correctional Institute at Frame Lake had the highest level in lettuce.

For all the above cases, the difference between the highest and lowest valves were about two fold.

An anomalous situation was found with parsley grown at Willow Flats, Old Town. Samples collected on July 26 and August 28, in the same garden plot showed valves of 1.05 and 0.10 mg/Kg respectively. These data should be confirmed by resampling in subsequent years.

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TABLE 1

TOTAL ARSENIC IN FRESH VEGETABLES GROWING AROUND YELLOWKNIFE, NWT

(CROP OF SUMMER 1978)

#	VEGETABLE	GROWING AREA	TOTAL As, mg/Kg, Fresh Weight	
			Unwashed sample	washed sample
1	Rhubarb	Giant Mine Area	0.36	0.17
2	Lettuce	Downtown, Yellowknife	0.16	0.10
3	Lettuce	Downtown, Yellowknife	0.32	0.08
4	Lettuce	Con Mine Area	0.31	0.08
5	Lettuce	Willowflats, Old Town	0.25	0.12
6	Celery	Willowflats, Old Town	0.20	0.16
7	Green Onion	Willowflats, Old Town	0.69	0.42
8	Dill weed	Willowflats, Old Town	0.49	0.35
9	Parsley	Willowflats, Old Town	1.80	1.05
0	Rhubarb	Con Mine Area	0.25	0.15
1	Radish	Con Mine Area	0.85	0.72
2	Lettuce	Frame Lake Area, Correctional Centre	0.40	0.34
3	Goose berries	Con Mine Area	0.11	0.07
4	Raspberries	Con Mine Area	0.79	0.27
5	Blueberries	Con Mine Area	0.44	0.14
6	Blackcurrants	Con Mine Area	0.22	0.14
7	Labrador Tea	Con Mine Area	2.05	1.58
8	Rose Hips	Con Mine Area	0.12	0.06
9	Pea Pods	Willowflats, Old Town	0.09	0.06
0	Carrots	Willowflats, Old Town	0.25	0.18
1	Cabbage	Willowflats, Old Town	0.21	0.14

TABLE 1 (continued...)

TOTAL ARSENIC IN FRESH VEGETABLES

GROWING AROUND YELLOWKNIFE, NWT

(CROP OF SUMMER 1978)

#	VEGETABLE	GROWING AREA	TOTAL As, mg/Kg, Fresh Weight	
			Unwashed sample	washed sample
22	Beetroot	Willowflats, Old Town	0.40	0.35
23	Beet Leaves	Willowflats, Old Town	0.40	0.26
24	Parsley	Willowflats, Old Town	0.26	0.10
25	Yellow Turnips	Giant Mine Area	0.24	0.14
26	Pea Pods	Giant Mine Area	0.20	0.12
27	Cabbage	Giant Mine Area	0.36	0.23
28	Onions	Giant Mine Area	2.25	1.20
29	Potatoes	Giant Mine Area	0.67	0.35
30	Beetroot	Giant Mine Area	1.00	0.68
31	Potatoes	Con Mine Area	0.24	0.16
32	Carrots	Con Mine Area	0.86	0.34
33	Green Onions	Con Mine Area	2.42	2.05
34	Cabbage	Con Mine Area	0.13	0.10
35	Cranberries	Golf Course, Airport Area	0.18	0.15
36	Carrots	Downtown, Yellowknife,	0.20	0.09
37	Beetroot	Downtown, Yellowknife	0.36	0.28
38	Onions	Downtown, Yellowknife	0.25	0.12
39	Potatoes	Downtown, Yellowknife	0.14	0.11
40	Peapods	Frame Lake Area, Correctional Centre	0.17	0.05
41	Carrots	Frame Lake Area, Correctional Centre	0.37	0.18
42	Potatoes	Frame Lake Area, Correctional Centre	0.11	0.10

TABLE 2

TOTAL ARSENIC IN FRESH VEGETABLES (WASHED SAMPLES)

(YELLOWKNIFE, CROP OF SUMMER 1978)

	CON MINE	GIANT MINE	OLD TOWN	DOWNTOWN	FRAME LAKE AREA
eet leaves			0.26		
eet root		0.68	0.35	0.28	
lackcurrants	0.14				
lueberries	0.14				
abbage	0.10	0.23	0.14		
arrots	0.34		0.18	0.09	0.18
elery			0.16		
ranberries	0.15				
ill weed			0.35		
ooseberries	0.07				
reen onions	2.05		0.42		
abrador tea	1.58				
ettuce	0.08		0.12	0.10, 0.08	0.34
nions		1.20		0.12	
arsley			0.10,1.05		
ea Pods		0.12	0.06		0.05
otatoes	0.16	0.35		0.11	0.10
adish	0.72				
aspberries	0.27				
hubarb	0.15	0.17			
ose hips	0.06				
urnips		0.14			

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